

Soft Umbilical Test-Bed

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The Space Station Furnace Facility (SSFF) is a centerpiece for the material science to be conducted on the *International Space Station*. This facility will accommodate several different types of furnaces used for semi-conductor crystal growth in space. In order to maintain the proper environment for optimal crystal growth, these furnaces are mounted in isolation systems to protect them from unwanted vibrations and motion generated by the Space Station. The current generation of furnace isolation systems performs well, and maintains the proper environment for crystal growth. The drawback to these systems is that they cannot tolerate excessive loads during operation. The main source of excessive loads is the set of umbilicals used to supply station resources to the furnaces. These umbilicals consist of electrical power cables, data cables, gas and cooling water hoses, and vacuum lines. Each furnace requires a unique set of umbilicals that must

be designed and tested to ensure proper isolation capability. The soft umbilical test-bed will be used to measure the forces produced by these umbilical sets in order to verify that proper isolation will be possible during on-orbit operation.

The soft umbilical test-bed consists of a 6-degrees-of-freedom load cell mounted on a three-axis motion system operated by computer control. This assembly is mounted on a large optical table which can accommodate any foreseeable size of umbilical member. One end of the umbilical is held fixed, and the other end is attached to the load cell. The load cell is moved throughout the operating range of the isolation system while force and moment data are continuously collected. These data can be displayed visually, as well as saved to disk for later retrieval. The control program is written in Labview, which is a graphically oriented data acquisition language, along with Motion Toolbox, which is used to operate the motion control system. The motion control and data acquisition occur simultaneously, and act as a standard computer application requiring minimal operator training.

Utilizing the soft umbilical test-bed will allow Space Station engineers to test all required configurations of furnace umbilicals. Future additions to this system will allow the testing of the entire umbilical set in one operation, saving considerable development time.

Sponsor: Space Station Furnace Facility

Biographical Sketch: Rodney Krienke is currently a cooperative education student in his senior year of mechanical engineering at the University of Alabama in Huntsville. He is in his third work term here at NASA working in the Mechanical Systems Design Group of the Propulsion Laboratory. As an avionics technician in the United States Marine Corps for over 4 years, Rodney has extensive experience with electronic systems especially including computer-controlled, automated test equipment. ■



FIGURE 41.—Large subscale solid rocket combustion simulator.